SHRIGURURAMRAIUNIVERSITY

[Estd. By Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act no. 03 of 2017 & recognized by UGC u/s(2f) of UGC Act 1956]

Syllabus

For

M. Sc. Pharmaceutical Chemistry

(One Year Course-Semester System)

National Education Policy (NEP)-2020

Under CBCS Pattern

(Effective from Academic Session 2025-2026 Onward)

School of Basic & Applied Sciences

VISION AND MISSION- DEPARTMENT OF PHARMACEUTICAL CHEMISTRY

Vision

1. To produce technical expertise by employing superior research and development, education, training, and learning, while considering the global environment and human society.
2. To provide good and quality education in the fields of Chemical Sciences, Pharmaceutical Sciences, Life Sciences, and Applied Sciences with proper training and practical expertise responsive to the needs of present and future centuries so that students excel and enhance their professional lives.

Mission

1. Providing a friendly learning ambiance to develop competence in diversified areas to create excellence in industrial, educational, research, and technical areas.
2. Provide an efficient educational environment where students and research scholars can realize their full potential in their chosen disciplinary subjects and attain quality education to face the challenges of the future.
3. Establish networks of collaborations and linkages with industries and academic institutes to produce an ethically and morally strong workforce contributing to the development of the knowledge economy.
4. Harness the skills of the students and assist them to excel in their professional life by providing lifelong learning skills, sound theoretical knowledge, practical experience, and all-round development with the help of well-qualified and experienced faculty. Inculcate moral and ethical values for character building.

CURRICULUM

MASTER OF SCIENCE-PHARMACEUTICAL CHEMISTRY

POST GRADUATE ONE YEAR DEGREE PROGRAMME

(2025-26Onward)

1. Nomenclature:

The M. Sc. in Pharmaceutical Chemistry program, also known as M. Sc. Pharmaceutical Chemistry, will be offered full-time. Its duration will be one year (one full academic year), divided into two semesters, each lasting six months. A minimum of 90 days of actual teaching will be required during each semester. Examinations for the first semester will typically be held in December, and for the second semester in May, or whenever it is most convenient for the university.

2. The Medium of Instruction: - English

3. The Medium of Examination: - English

4. Eligibility to apply for Admission:

No candidate shall be eligible for admission to a **one-year full-time** M. Sc. Pharmaceutical Chemistry unless He/She has completed a four-year undergraduate degree either Honors or Honors with Research (with any Chemical/Biological/Applied science/Agriculture sciences/Medical sciences/Biochemistry) with prescribed number of credits through the Examinations conducted by a University/Autonomous Institution or possesses such qualifications as recognized by the University. Further, a candidate holding a four-year Bachelor's Degree (either Honors or Honors with Research) in any chemical/biological/applied sciences discipline from a recognized university without a credit system shall also be eligible. The maximum age of a candidate taking admission to the program and the gap between the last Degree/Diploma courses shall be as per the norms prescribed by the university from time to time.

5. Selection Procedure for Admission:

A candidate willing to seek admission to M. Sc. Pharmaceutical Chemistry will have to appear in Written Entrance Test conducted by the University or on behalf of the University and followed by the counseling as per University norms. The selection for admission will be made on merit basis or as per University norms.

6. Semesters:

(a) An academic year shall consist of two semesters:

- Odd Semester (I Semester): generally July to November/December
- Even Semester (II Semester): generally January to May/June

The academic calendar for each semester shall be notified well before the commencement of the semester by the Dean, School of Basic and Applied Sciences.

(b) A semester shall normally extend over a period of 15 weeks. Each week shall have 30 hours of instruction including lab/ field work as applicable.

7. Credits:

(a) Credit defines the quantum of contents/ syllabus prescribed for a course and determines the number of hours of instruction required per week. Thus credits shall be assigned on the basis of the number of lectures/ tutorials / laboratory work/ project work and other forms of learning required completing the course contents in a 15 week schedule.

(b) 1 Credit = 1 hour of lecture for theory and 1 Credit = 3 hour of laboratory for practical and dissertation.

(c) Motivate students with industrial visit, educational trip, seminar/conference during semesters (not mandatory).

8. Roll Numbers and Enrolment Numbers:

The University shall allot a Roll Number to the students after payment realization, thorough scrutiny / verification of the required documents for the course. After the completion of the admission procedure the enrolment number for the students shall be allotted by the University at the entry point which shall remain same for the entire period of study in the University.

9. The Credit Based Course Structure: Master of Science (Pharma. Chemistry) - One Year Programme- As per NEP 2020 and Choice Based Credit System (CBCS)

One year Master's Program in Pharma. Chemistry shall be based on the choice based credit system or as per NEP 2020 in which credit defines the quantum of content/ syllabus prescribed for a course system and determines the number of hours of instruction per week.

The student shall be eligible for admission to one year Master's Degree Program in Pharma. Chemistry after he/she has successfully completed a four years undergraduate degree (either Honors or Honors with Research) or earned prescribed number of credits through the examinations conducted by University as equivalent to an undergraduate four year degree program (either Honors or Honors with Research).

Core courses prescribed for every Semester shall be mandatory for all students registered for the one year Master's Program in Pharma. Chemistry and shall carry minimum 40 credits (for one year program). There shall be Elective courses offered in semester I and shall carry a minimum of 10 credits and 10 credits shall be covered by two core paper both are consider as course paper with 20 credits. A self-study course would comprise of maximum 06 credits of which minimum 03 credits shall be mandatory which shall not be included while calculating grades. The student may choose self-study course either only in one of the two semesters (I/II). The self study course shall be based on advanced topics.

The dissertation is a semester long core course of 20 credits and is mandatory for every student. The dissertation would be allotted in the beginning of III Semester and candidate would submit the thesis/report during IV Semester examination. The dissertation may be in the form of an Industry research/field based research work/ project work/ practical training. The students may complete the dissertation work in the department/ other research institutes/ industries/ hospitals etc.

The 1- Year Masters Programme will have the following components:

1) Core course (C): Minimum 10 credits
2) Elective course (E): Minimum 10 credits (Core + Elective = Course papers)
3) Major Research/Dissertation 20
4) Self study course: Maximum 06 credits (one minimum 03 credits shall be mandatory but not to be included while calculating grades).

10. Student Advisor:

Every student shall have a teacher of the Department as his/her Student Advisor. All teachers of the department shall function as Student Advisors and will have more or less equal number of students with them. The Student Advisor will advise the students in choosing Elective courses and offer all possible student support services.

11. Attendance:

a. The teacher handling a course shall be responsible for maintaining a record of attendance of students who have registered for the course.
b. All teachers shall intimate the Head of the Department at least seven calendar days before the last instruction day in the semester, the particulars of all students who have less than 75% attendance in one or more courses.
c. A candidate who has less than 75% attendance shall not be permitted to sit for the End-semester examination in the course in which the shortfall exists. However, it shall be open to the Dean/HOD to grant exemption to a candidate who has failed to obtain the prescribed 75% attendance for valid reasons on payment of prescribed fee and such exemptions shall not under any circumstances be granted for attendance below 60%.
d. A candidate who fails to put in least 75% attendance in I semester shall not be allowed to pursue the studies in II semester. Such candidates may apply to the Dean/HOD for re-registration in the I semester in the next academic session.

Note: Rest of the provisions will be as framed by the University.

12. Fee and Resource Generation

As per decision of the University.

13. Examination and Evaluation

(a) Evaluation will be done on a continuous basis. Three times during each semester. For The purpose of uniformity, there will be a uniform procedure of examination to be adopted by all teachers. There will be two Sessional tests (Three if any student are unable to attend any Sessional test) and one End-semester examination.

(b) Sessional tests (of one to two hours duration) may employ one or more assessment tools such as objective tests, assignments, paper presentation, laboratory work, etc suitable to the course. This requires an element of openness. The students are to be informed in advance about the nature of assessment. It will be obligatory for the Students to attend the both Sessional tests, failing which they will not be allowed to appear in the concerned semester examination. The Sessional test as part of the continuous internal assessment shall be conducted and evaluated by the teacher offering the course.

A Student cannot repeat Sessional Tests (without permission from HOD). However, if for any compulsive reason the student could not attend the test, the prerogative of arranging a special test lies with the teacher with the approval of the Head of the Department. In case of students who could not attend any of the Sessional tests due to medical reason or under extra ordinary circumstances, a separate test shall be conducted before the concerned semester examinations by the concerned faculty member after the approval of the Head of the Department and the Dean concerned.

(c) The Sessional tests will carry 40% of total marks for the course. The marks of the two Sessional Tests shall be taken into account for the computation of Grades.

(d) There shall be a written End Semester Examination which shall be of 2/3 hours duration carrying 60% of total Marks assigned for the course, covering the entire syllabus prescribed for the course.

(e) The End Semester practical examinations (field tour report, project report and Training report) shall normally be held before the theory examination/or as per convenience by the Department. The internal faculty shall associate themselves with the examination process.

(f) Valuation of Dissertation and Viva- voce: Dissertation / project report shall be evaluated jointly by internal and one external examiner.

OUTCOME BASED EDUCATION

Programme outcome (POs)

PO1	**Problem analyze**: Identify, formulate, review research literature and analyze the chemical problems reaching substantiated conclusions using basics concepts of mathematics, physics and biology.
PO2	**Design and development of solutions:** Design solutions for complex chemical problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations
PO3	**Conduct investigations of complex problems:** Use research based knowledge and including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
PO4	**Gaining knowledge**: In drug development and new drug synthesis, discovering economically cheaper eco-friendly non-conventional green chemistry methods.
PO5	**Develop analytical instrumental techniques**: Instrumental technique for identification, characterization and quantification of drugs/ compounds.
PO6	**Drug discovery:** Describe different techniques of organic synthesis, mechanisms, their application to process chemistry and drug discovery. Design and develop lead molecules using CADD.
PO7	**Characterization and quantification:** Isolate, elucidate and characterize compounds from natural origin. Operate equipment / instruments required for the characterization and quantification of organic compounds/ Drugs.
PO8	**Green Chemistry:** Design new techniques of organic synthesis using green chemistry. Design and implement research projects independently.
PO9	**Development of drug delivery system:** Apply the principles of drug delivery system in the development of eco-friendly, efficacious dosage forms.
PO10	**Development of drug delivery system:** Apply the principles of drug delivery system in the development of eco-friendly, efficacious dosage forms.
PO11	**Biopharmaceutics:** The basic concepts in biopharmaceutics and pharmacokinetics. Understand, the critical evaluation of biopharmaceutical studies involving drug Parameters the best describe the process of drug absorption, distribution, metabolism and elimination.
PO12	**Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

Program Specific Outcome (PSOs)

PSO1	Global level research opportunities to pursue Ph.D programme and targeted approach of CSIR –NET examination.
PSO2	To execute new ideas in the field of research and to develop principles and techniques of science through seminars and the project work.
PSO3	To demonstrate about potential uses of medicinal chemistry and green chemistry.
PSO4	To illustrate mechanism and stereochemical aspects of different reactions.

Eligibility for admission:

Any candidate who has passed the B. Sc. with Chemical Science/Biological Science subject with not less than 45%- marks in aggregate is eligible for admission; However, SC/ST, OBC and other eligible communities shall be given relaxation as per University rules.

Duration of the Programme: 1 Year

STUDY & EVALUATION SCHEME
Choice Based Credit System/ ECS/NEP-2020
Master of Science- Pharmaceutical Chemistry

First Semester

S. No.	Course Category	Course Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
1	Core	MPCC 101	Introduction to Pharmaceutical Technology and Biopharmaceutics	3	0	0	3	40	60	100
2	Core	MPCC 102	Medicinal Chemistry	3	0	0	3	40	60	100
3	Elective -I	MPCE 103 (a)	(a) Phytoceuticals & Nutraceuticals	3	0	0	3	40	60	100
		MPCE 103 (b)	(b) Biochemistry & Metabolism	3	0	0	3	40	60	100
		MPCE 103 (c)	(c) Advance in Natural Product	3	0	0	3	40	60	100
4	Elective -II	MPCE 104 (a)	(a) Drug Design	3	0	0	3	40	60	100
		MPCE 104 (b)	(b) Standardization of Herbal Drug	3	0	0	3	40	60	100
		MPCE 104 (c)	(c) Cosmeticology	3	0	0	3	40	60	100
5	Core	MPCL 105	Laboratory-I (Pharmaceutical Technology & Biopharmaceutics)	0	0	4	4	40	60	100
6	Core	MPCL 106	Laboratory-II (Based on electives)	0	0	4	4	40	60	100
7	*Self Study (Anyone)	MPCS 107 (a)	(a) Traditional Health Care SystemUttarakhand Including Ayurvedic Medicine	3	0	0	3	40	60	100
		MPCS 107 (b)	(b) Forensic Pharmacy	3	0	0	3	40	60	100
			Total	15	0	8	20+3*	280	420	600+100*

L–Lecture, T–Tutorial, P–Practical, C – Credit

*A self-study course would comprise of maximum 06 credits of which minimum 03 credits shall be mandatory which shall not be included while calculating grades.

Second Semester

S. No.	Course Category	Course Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
1	Research	MPCR 201	Dissertation	0	0	0	20	120	480	600
2	*Self Study Anyone	MPCS 202 (a)	(a) Drug Regulatory Affairs	3	0	0	3	40	60	100
3		MPCS 202 (b)	(b) Herbal Drug Technology	3	0	0	3	40	60	100
4		MPCS 202 (c)	(c) Essential of Traditional Medicine	3	0	0	3	40	60	100
5		MPCS 202 (d)	(d) Advance Drug Delivery	3	0	0	3	40	60	100
			Total	6	0	4	20	180	420	600

L–Lecture, T–Tutorial, P–Practical, C – Credit

*Self Study=Student can take either in I Semester or II Semester (Not mandatory in II semester)

Dissertation Marks Distribution = 300 Marks for project submission and 300 Marks for Internal (120 Marks) + External (180 Marks) for project presentations.

Examination Scheme:

Components	Ist internal Assignment/Presentation-I	IInd Internal Written/Attendance/ Presentation-II	External (ESE)
Weightage (%) Theory	**20Marks**	**20 Marks**	**60 Marks**
Practical	**20Marks**	**20 Marks**	**60 Marks**
Weightage (%) Dissertation	**60Marks**	**60 Marks**	**480 Marks**

Course Outcome (CO)

MPCC 101	**Introduction to Pharmaceutical Technology and Biopharmaceutics**	**CO1-** Outline the basics about biopharmaceutics, absorption, distribution, elimination, compare bioavailability and bioequivalence, pharmacokinetics and nonlinear pharmacokinetics.
		CO2- Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
		CO3- Discuss the methods to enhance the dissolution rate and Bioavailability of poorly soluble drugs, IVIVC and bioequivalence.
		CO4-Categorize the various dosage forms and their formulations and evaluation.
		CO5- Explain the concepts of bioavailability and bioequivalence of drug products and their significance.
		CO6-Discuss application of pharmaceutical technology in biopharmaceutics application.
MPCC 102	**Medicinal Chemistry**	**CO1-** Outline the fundamental knowledge of structure, class, mechanism of action, uses, SAR and synthesis of pharmacodynamic agents.
		CO2- Understand, summarize the chemical synthesis of selected drugs, fundamental knowledge of structure, adverse effects and therapeutic values of drugs.
		CO3- Apply and articulate the class, structures, mechanism of action and medicinal uses of pharmacodynamic agents.
		CO4- Analyze, illustrate and categorize drugs.
		CO5- Evaluate, prioritize and reference the importance of structural activity relationship of different class of drug.
		CO6- Discuss and write about class, structure, therapeutic value of drugs.
MPCE 103 (a)	**Phytoceuticals & Nutraceuticals**	**CO1-** Outline the definitions, history and applications etc. of pharmaceuticals and nutraceuticals.
		CO2- Understand the importance of Nutraceuticals for healthy life.
		CO3- Utilize the general principles of formulations of plant metabolites.
		CO4- Analyze the adulteration and evaluation of drugs.
		CO5- Explain the environmental factors influencing the variety of nutraceuticals and pharmaceuticals.
		CO6-Elaborate the biosynthesis of natural products.
MPCE 103 (b)	**Biochemistry & Metabolism**	**CO 1-**Define the basic concepts of biochemistry with complete understanding of the molecular levels of the chemical process associated with living cells.
		CO 2-Understand the chemistry of biomolecules & their biological roles.
		CO 3-Apply the knowledge of biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions.

		CO 4-Analyze the significance of catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
		CO 5-Evaluate the concept of metabolism of nutrient molecules physiological & pathological conditions.
		CO 6-Discuss about qualitative and quantitative estimation of the biological macromolecules.
MPCE 103 (c)	**Advance in Natural Product**	**CO1-** Outline the fundamentals of chemistry of natural products.
		CO2- Understand the chemistry of various natural products.
		CO3- Utilize the organic reactions for the identification of natural products.
		CO4- Examine the chemistry of natural products.
		CO5- Explain the concept of various extraction methods of natural products.
		CO6- Discuss the utility of natural products.
MPCE 104 (a)	**Drug Design**	**CO1-** Outline the basic role of drug design in drug discovery process.
		CO2- Understand the concept of QSAR, isosterism and biosterism and docking etc.
		CO3- Apply various stereochemical aspects of drug action to design the drug molecules.
		CO4-Analyze and design new drug molecules using molecular modelling software.
		CO5-Evaluate the Structural Activity Relationship of different class of drugs.
		CO6-Discuss the concept of isosterism and bioisosterism, QSAR etc. and their application in drug design.
MPCE 104 (b)	**Standardization of Herbal Drug**	**CO1-** Outline the basic role of herbal medicine in health care.
		CO2- Understand the phytomedicines and herbal therapeutics.
		CO3- Apply the safety and contaminants in herbal drugs.
		CO4- Analyze the toxicity, risk assessment and challenges with safety of herbal drugs.
		CO5- Evaluate the standardization of herbal drugs and plant extract.
		CO6- Discuss the validation technique for herbal products.
MPCE 104 (c)	**Cosmeticology**	**CO1-** Outline the process of discovery and development of cosmetics with Evaluation of cosmetics .
		CO2- Understand the regulatory authorities and agencies governing the manufacture and sale of cosmetics..
		CO3- Apply the regulatory approval process and their registration in Indian and international markets of cosmetics.

		CO4- Analyze the quality control evaluation safety and efficacy of cosmetics.
		CO5- Evaluate the clinical safety testing**.**
		CO6- Discuss the basic principle of cosmetic technology.
MPCL 105	**Laboratory I Pharmaceutical Technology and Biopharmaceutics**	**CO1-** Formulations of tablets.
		CO2- Formulation of parenterals.
		CO3- Evaluations of pharmaceutical formulations.
		CO4- Formulation of semisolids and evaluation by assay.
MPCL 106	**Laboratory II**	Based on Electives.
MPCS 107 (a)	**Traditional Health Care System Uttarakhand Including Ayurvedic Medicine**	**CO1-** Outline the basic concept and classification of traditional and herbal drugs.
		CO2- Understand general method of extraction and analysis of herbal products.
		CO3- Develop therapeutic uses and applications of secondary metabolites.
		CO4- Analyze preparation and standardization of Ayurvedic preparation.
		CO5- Evaluate the formulations of ayurvedic preparations.
		CO6- Discuss the concept to study various traditional and herbal drugs.
MPCS 107 (b)	**Forensic Pharmacy**	**CO1-** Outline the definitions under different acts and rules.
		CO2- Describe the regulatory authorities and agencies, governing the manufacture and sale of pharmaceuticals and the profession of pharmacy.
		CO3- Demonstrate the functioning of various Indian pharmaceutical Acts and Laws.
		CO4- Examine salient features of different act**.**
		CO5- Assess different guidelines and concepts under different act.
		CO6- Discuss and elaborate on the execution of different acts.

Mapping of Cos with Pos & PSOs

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3	3	3	2	3	3	3	3	3	3	3	2	2
CO2	3	3	2	2	2	2	2	3	3	3	3	2	3	3	3	3
CO3	2	3	2	2	3	3	3	2	2	2	3	3	3	3	3	3
CO4	2	3	2	3	2	2	3	3	3	1	3	2	2	2	2	2
CO5	2	3	3	3	2	2	3	3	3	2	2	3	3	3	3	2
CO6	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

3: High, 2: Medium, 1: Low

M. Sc. Pharmaceutical Chemistry Ist Sem.
INTRODUCTION TO PHARMACEUTICAL TECHNOLOGY AND BIOPHARMACEUTICS
PAPER CODE- MPCC 101

Lecture: 3 Hrs/week **Max. Marks: 100**

UNIT-I

Liquid orals: Formulation and manufacturing consideration of solutions, suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

UNIT-II

A. **Parenteral Products:** Pre-formulation factors, routes of administration, water for injection, pyrogenicity, nonaqueous vehicles. Formulation and evaluation, equipments, containers and closures and their selection.
B. **Ophthalmic Preparations:** Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

UNIT-III

Biopharmaceutical classification system

Drug Absorption: Mechanism of drug absorption through GIT (Passive diffusion, Active transport)

Factor influencing drug absorption through GIT (Physicochemical, Pharmaco-Technical and Biological factors).

UNIT-IV

Drug Disposition:

Distribution of drugs, binding of drugs, apparent volume of drug distribution, protein binding of drugs and kinetics of protein binding.

Biotransformation and Excretion of drugs

UNIT-V

Bioavailability and Bioequivalence:

Objective of bioavailability studies, absolute and relative bioavailability, measurement of bioavailability, in-vitro drug dissolution models, in-vitro, in-vivo correlations, bioequivalence studies protocol and regulatory requirements.

Recommended Books: (Latest Editions)

1. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
2. Lachmann. Theory and Practice of Industrial Pharmacy, Lea & Febiger Publisher, The Universityof Michigan.
3. Pharmaceutics- The science of dosage form design by M. E. Aulton, Churchill livingstone
4. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
5. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B. Jaiswal, Vallabh Prakashan Pitampura, Delhi
6. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987.

M. Sc. Pharmaceutical Chemistry Ist Sem.
MEDICINAL CHEMISTRY (PHARMACODYNEMIC AGENTS)
PAPER CODE- MPCC102

Lecture: 3 Hrs/week **Max. Marks: 100**

Chemical Classifications, SAR Studies, Mode of actions and Therapeutic uses of the following classes of drugs.

Unit-I Drugs acting on CVS – Antianginals, Antihypertensives, Antilipidemics, Antiarrhythmics, Diuretics.

Unit-II Analgesics – Narcotic and NSAIDs, Antipyretics, Uricosurics (Antigouts).

Unit-III Drug acting on CNS – Hypnotic, Sedative drugs, Antiepileptics, General & local anaesthetics, Antiparkinsonian drugs

Unit-IV Psychotherapeuticals – Antipsychotics, Anxiolytic drugs, Antidepressants and Antidiabetics.

Unit-V H_1–blockers (Anti-histaminics), H_2-blockers (Anti-ulcers), Carbohydrate based drugs, Oligonucleotides.

Synthesis of following drugs: Acetazolamide, Amantidine HCl, Chloropheniramine, Chloropromazine, Chlorothiazide, Clofibrate, Clonidine HCl, Diphenyhydramine, Ethacrynic acid, Felodipine, Ibuprofen, Isosorbide dinitrate, Labetolol, Nalorphine, Phenobarbital, Phenytoin, Procainamide, Propranolol, Ranitidine, Verampil, Fluoxetine,Metformin, Benzocaine, Ketamine, levodopa,

Recommended Books: (Latest Editions)

1. William O. Foye, Principles of Medicinal Chemistry, 3rd ed., Varghese Publishing House, Mumbai,1989.
2. Jaime N. Delgado & William A. Remers, Wilson and Gisvold's, Text Book of Organic Medicinal andPharmaceutical Chemistry, 9th ed. J.B. Lippincott Company, Philadelphia, 1991.
3. Manfred E. Wolff, Burger's Medicinal Chemistry & Drug Discovery, 5th ed., Wiley Interscience, NewYork, 1995.
4. H. Singh and V.K. Kapoor, Medicinal and Pharmaceutical Chemistry, 1st ed., Vallabh Prakashan,Delhi, 1996.
5. Ashutosh Kar, Medicinal Chemistry, New Age International (P) Limited, New Delhi, 1993.

M. Sc. Pharmaceutical Chemistry Ist Sem
ELECTIVE PAPER- PHYTOPHARMACEUTICALS AND NUTRACEUTICALS
PAPER CODE- MPCE 103 (a)

Lecture: 3 Hrs/week **Max. Marks: 100**

Unit I
Introduction Definition, historical background present status and future scope of Phytophrmaceuticals.

Unit II
Classification of crude drug: Alphabetical, morphological, pharmacological and chemical classification.

Unit III
Adulteration and evaluation of drugs: Causes and types of Adulteration organoleptic, biological, chemical and physical methods of evaluation.

Unit IV
General principle of formulation of primary and secondary plant metabolites. Biogenesis of carbohydrates, lipids, volatile oils and resins.

Unit V
Plants and their environmental factors influencing the variability in drug activity

Unit VI
General introduction and uses of Nutraceuticals.

Unit VI
An introduction to tissue culture and its scope in production of phytopharmaceuticals

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London,2009.
2. Text Book of Pharmacognosy by T.E. Wallis
3. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, NewDelhi.
4. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, NiraliPrakashan, New Delhi.
5. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
6. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007

M. Sc. Pharmaceutical Chemistry Ist Sem
ELECTIVE PAPER
BIOCHEMISTRY AND METABOLISM
PAPER CODE- MPCE 103 (b)

Lecture: 3 Hrs/week **Max. Marks: 100**

Unit I **Enzymes:** Definition; Nomenclature; IUB classification; Factor affecting enzyme activity; Enzyme action; Coenzymes and their biochemical role.

Unit II

Energy metabolism, bioenergetics, introduction to intermediary metabolism,

a. **Carbohydrate metabolism**: Glycolysis, Citric acid cycle (TCA cycle) Metabolic disorders of carbohydrate metabolism (diabetes mellitus and glycogen storage diseases);
b. **Lipid metabolism:** Oxidation of saturated (β-oxidation); Ketogenesis and ketolysis; Defective metabolism of lipids (Atheroslerosis, fatty liver, hypercholesterolmiea).
c. **Protein and amino acid metabolism:** protein turn over; nitrogen balance; Catabolism of Amino acids (Transamination, deamination & decarboxylation). Urea cycle and its metabolic disorders; hyperbilirubinemia, porphoria, jaundice.
d. **Nucleic acid metabolism:** Metabolism of purine and pyrimidine nucleotides; Protein synthesis; Genetic code; inhibition of protein synthesis; mutation and repair mechanism; DNA replication (semiconservative /onion peel models) and DNA repair mechanism.

Unit III

Brief introduction of kidney function tests, Liver function test, Lipid profile tests.

Recommended Books: (Latest Editions)

1. Robert K. Murray, Daryl K. Grapper, Pater A. Mayes, Victor, W. Rodwell, Harper's Biochemistry,25th ed., MCGraw Hill health Professions Division, New York, USA, 1998.
2. A.V.S.S. Rama Rao, Text Book of Biochemistry, 6th ed., L.K. & S. Publishers. Visakhapatanam,1991.
3. Melson David L. Lehninger Principles of Biochemistry, 3rd ed., Macmillan worth publishers. N. Y.USA, 2001.
4. Stryer Lubert, Berg Jeremy M., Tymoezko Johan L., Biochemistry, 5th ed., W. H. Freeman &Company, New York, 2002.
5. M.C. Pant, Essentials of Biochemistry, 8th ed., Kedar nath Ram Nath & Co publishers, Meerut,1996.
6. E. David Metzler, Carol M. Metzler, David J. Sauke, Biochemistry the chemical reactions of livingcells, 2nd ed., Har court/Academic Press, New York.

M. Sc. Pharmaceutical Chemistry Ist Sem.
ELECTIVE PAPER
ADVANCE IN NATURAL PRODUCT
PAPER CODE- MPCE 103 (c)

Lecture: 3 Hrs/week **Max. Marks: 100**

Unit-I

Carbohydrate: Introduction, ring structure of glucose, structure elucidation of disaccharides- sucrose, maltose, lactose, polysaccharides- starch and cellulose. Cardiac glycosides, Introduction, chemistry and important reactions.

Unit-II

Alkaloids : General introduction, distribution in plants, classification, isolation & purification. General methods of structure determination. Structural elucidation of atropine, quinine, nicotine, aquientance with the structure of alkaloids vincristin, vinblastin and reserpin

Unit-III

Terpenoids: General introduction, classification, isolation & purification and applications, isoprene, structure elucidationof citral, menthol, camphor,

Unit-IV
Steroids and Hormones, General chemistry of Cholesterol, and Positron (Ring skeleton, ring chemistry and some important reactions)

Recommended Books (Latest Editions)

1. I.L. Finar, Organic chemistry, Vol. II, 1st Indian ed., Pearson Education Pte Ltd Indian Branch, Delhi, 2002.
2. O.P. Agarwal, Chemistry of Natural Products, Vol. I & II, 7th ed., Goel Publishing House, Meerut, 1983

M. Sc. Pharmaceutical Chemistry Ist Sem.
ELECTIVE PAPER-II DRUG DESIGN
PAPER CODE- MPCE 104 (a)

Lecture: 3 Hrs/week **Max. Marks: 100**

Unit-I

Specific and non-specific drug action , Drug receptors, Basic concept and classification of receptors, Forces involved in drug receptors- interactions , Receptor agonism and antagonism , Concept of Spare receptors , Simple kinetics of drug- receptor interaction , Receptor theories: Clark's occupancy theory, Ariens-Stephenson modification, Induced fit and macromolecular perturbation theories , Ion Channel receptors

Unit-II

Topographical study of the following receptors includes only preferred conformations, pharmacophores and modes of bindings/interactions, Adrenergic, Cholinergic, Opioid receptors, H-1 & H-2 receptors, Diazepine, Serotonin

Unit-III

Concept of isosterism and bioiososterism and their applications in drug design, Antimetabolite approach to drug design, Analog drug design, Prodrugs and drug latentiation Carrier-linked prodrugs, Bioprecursors, Role of functional groups in prodrug design, General pathways of drug metabolism

Unit-IV

Stereochemical aspects of drug action, Setereoselectivity of optical isomers, Role of planarity in drug action, Stereoselectivity of conformational isomers, QSAR including, Types of QSAR models, Classification of parameters utilized in QSAR studies , Statistical concept of QSAR, Hansch model of QSAR, De Novo model of QSAR, Hammett and Taft model of QSAR equations , Applications of QSAR in drug design

Unit-V

Basics of combinatorial chemistry, Rational approach to drug design , Basic strategies of drug discovery , Role of molecular docking/modeling in drug design, computer assisted drug design

Recommended Books: (Latest Editions)

1. William O. Foye, Principles of Medicinal Chemistry, 3rd ed., Varghese Publishing House, Mumbai, 1989.
2. Jaime N. Delgado & William A. Remers, Wilson and Gisvold's, Text Book of Organic Medicinal andPharmaceutical Chemistry, 9th ed. J.B. Lippincott Company, Philadelphia, 1991.
3. Manfred E. Wolff, Burger's medicinal Chemistry and Drug Discovery, Vol. I to V, 5th ed., A Wiley-Interscience publication John Wiley & Sons, Inc. (New York), 1995.
4. Kadam & Mahadik, Bothara, Principles of Medicinal Chemistry vol. I & II, 4th ed. Nirali Prakash Pune, 1997.

M. Sc. Pharmaceutical Chemistry Ist Sem.
ELECTIVE PAPER-II STANDARDIZATION OF HERBAL DRUGPAPER CODE- MPCE 104 (b)

Lecture: 3 Hrs/week **Max. Marks: 100**

Unit I:

General Introduction to Medicinal Plants, Phytomedicine and Herbal Therapeutics, Role of Herbal Medicine in Health Care

Unit II:

Safety of Herbal Drugs, Contaminants in Herbal Drugs, Development of monitoring systems for safety of herbal drugs, Assessment of toxicity of herbal drugs, risk assessment and challenges with safety of herbal drugs, Assessment of Efficacy of Herbal Drugs – Methods, tools and application.

Unit III:

Overview of Standardization of Herbal Drugs and Plant Extracts. Need and scope of Standardization, Protocols for standardization of herbal drugs, Challenges with standardization of herbal drugs, validation techniques for herbal products.

Recommended Books (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16$_{th}$ edition, W.B. Sounders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37$_{th}$ Edition, Nirali Prakashan, New Delhi.
6. Herbal drug industry by R.D. Choudhary (1996), I$_{st}$ Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007.

M. Sc. Pharmaceutical Chemistry Ist Sem.
ELECTIVE PAPER-IICOSMETICOLOGY
PAPER CODE- MPCE 104 (c)

Lecture: 3 Hrs/week **Max. Marks: 100**

Unit I:

General Physiology of skin, hair, nails and eye with reference to cosmetic application. Principles of cosmetic technology. Various additives like preservatives, antioxidants, colours and stabilizers used in cosmetics, Rheology of cosmetics

Unit II:

Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens, cosmetic creams, powders, compacts, sticks, liquids, foam and aerosol cosmetics.

Unit III:

Quality control of cosmetics, evaluation of quality, safety and efficacy of cosmetics. Testing of creams, deodorants, antiperspirants, powders.

Unit IV:

Clinical safety testing: Irritation, sensitization, photo irritation, photo-allergy, ocular irritation and protocols for the same. Regulatory requirements: Manufacturing and sale of cosmetics.

Unit V:

Formulation development of herbal cosmetics, packaging of cosmetics, and advances in cosmetics in respect to liposomes and contact lenses

Recommended Books (Latest Editions)

1. C. G. Gebelein, T.C. Cheng and V.C. Yang; Cosmetic and Pharmaceutical applications of polimer; plenum.
2. Dr. Laba, Rheological properties of cosmetics and toiletries, Marcel Dekker.
3. E. G. Thomsson ; Morder Cosmetics; Universal Publishing Corporation.
4. H. R. Moskowitz; Cosmetic Product Testing; Marcel Dekker.
5. J Knolton and S Rearce; Handbook of cosmetic sciences and technology; Elsevier science publisher.
6. J. B. Wilkinson and RJ Moore; Harry's cosmetology; Longmr, j. Sscience and Technical.
7. L. Appell; The formulation and preparation of cosmetics, fragrances and flavours; Micelle Press.

M. Sc. Pharmaceutical Chemistry Ist Sem.
Laboratory-I (Pharmaceutical Technology)
PAPER CODE- MPCL 105

4 Hrs/ Week **MM:100**

1. Formulation of Tablets
- a. Ordinary compressed tablet-wet granulation.
- b. Tablets prepared by direct compression.
- c. Fast dissolving tablet tablet..

2. Formulation and filling of hard gelatin capsules

3. Formulation of parenterals
- a. Ascorbic acid injection
- b. Dextrose and Sodium chloride injection/ infusion.

4. Evaluation of Pharmaceutical formulations (QC tests)
- a. Tablets
- b. Capsules
- c. Injections

5. Formulation of two liquid oral preparations and evaluation by assay
- a. Paracetamol Suspension
- b. Antacid suspensions
- c. Liquid paraffin emulsion

6. Formulation of semisolids and evaluation by assay
- a. Salicyclic acid ointment
- b. Gel formulation Diclofenac gel

7. Experiments designed for the estimation of various pharmacokinetic parameters with given data.

8. In *vitro* evaluation of different dosage forms for drug release.

9. Absorption studies – in vitro.

10. Bioavailability and Bioequivalence studies

11. Statistical treatment of pharmaceutical data.

M. Sc. Pharmaceutical Chemistry Ist Sem.
Laboratory-II (based on electives)
PAPER CODE- MPCL 106

4 hrs/ Week **MM: 100**

M. Sc. Pharmaceutical Chemistry Ist Sem
TRADITIONAL DRUGS INCLUDING AYURVEDIC MEDICINE
(Self study Course) PAPER CODE- MPCS 107 (a)

MM: 100

UNIT-1

Classification of drugs
Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

UNIT-II

General introduction, composition, chemistry & chemical classes, general methods of extraction & analysis, biosources, therapeutic uses and commercial applications of following secondary metabolites:

Alkaloids: Vinca, Rauwolfia, Belladonna, Opium,
Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta
Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis
Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander,
Tannins: Catechu, Pterocarpus
Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony
Glycosides: Senna, Aloes, Bitter Almond
Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, taxus, carotenoids

UNIT-III

Introduction to Ayurvedic Dosage Forms Preparation and Standardization of Ayurvedic Preparation such as Asavas, Aristha, Avaleha, Churna.

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16$_{th}$ edition, W.B. Sounders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37$_{th}$ Edition, Nirali Prakashan, New Delhi.
1. Herbal drug industry by R.D. Choudhary (1996), I$_{st}$ Edn, Eastern Publisher, New Delhi.
2. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007.

M. Sc. Pharmaceutical Chemistry Ist Sem
FORENSIC PHARMACY (Self study Course)
PAPER CODE- MPCS 107 (b)

MM: 100

UNIT-I

Pharmacy Act –1948: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; its constitution and functions, Registration of Pharmacists, Offences and

UNIT-II

Drugs and Cosmetics Act, 1940 and its rules 1945:

Objectives, Definitions, Legal definitions of schedules to the act and rules

Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties**.**

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,

Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

UNIT III

Medicinal and Toilet Preparation Act –1955: Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.

Narcotic Drugs and Psychotropic substances Act-1985 and Rules: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

UNIT-IV

Study of Salient Features of Drugs and magic remedies Act and its rules: Objectives, Definitio Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalti

Medical Termination of pregnancy act

Recommended books: (Latest Edition)

1. Forensic Pharmacy by B. Suresh 124
2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Drugs and Magic Remedies act by Govt. of India publication

IInd SEMESTER

Course Outcome (CO)

MPCR 201	**DISSERTATION**	**CO1-** To know the modern extraction techniques, characterization and identification of the synthetic drugs or herbal drugs and phytoconstituents.
		CO2- To understand the preparation and development of synthetic drugs or herbal formulation.
		CO3- To carryout isolation and identification of phyto-constituents.
MPCS 202 (a)	**Drug Regulatory Affairs**	**CO1-** Outline the basic concepts about the process of drug discovery and development.
		CO2- Understand the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals.
		CO3- Apply the regulatory approval process and their registration in Indian and international markets.
		CO4- Discover the knowledge about Good Laboratory Practice, calibration and validation etc.
		CO5- Explain the Calibration and validation in pharmaceutical industry.
		CO6- Create the basic principles of quality management system in pharmaceutical industry.
MPCS 202 (b)	**Herbal Drug Technology**	**CO1-** Outline the basic concept about herbs, biodynamic agriculture, herb food interaction, herbal excipients and GMP.
		CO2- Understand about Herbal Drug and Herb Food interactions.
		CO3- Develop the significance of Herbal Excipients.
		CO4- Discover various herbal formulations.
		CO5- Conclude the scope and future of Herbal Drug.
		CO6- Discuss the Good Manufacturing Practice of Indian System of Medicine.
MPCS 202 (c)	**Essentials of Traditional Medicine**	**CO1-**Outline the basic concept about history and scope of phytomedicines.
		CO2- Understand about alternative system of medicine.
		CO3- Utilize herbal drug remedies in India.
		CO4- Analyze the importance of phytoconstituents in therapy.
		CO5- Evaluate the extraction of herbal drugs.
		CO6- Explain about qualitative analysis of crude drugs.
MPCS 202 (d)	**Advance Drug Delivery**	**CO1-** Outline the basic concept of advance drug delivery including various dosage forms.

		CO2- Understand various approaches for development of novel drug delivery systems.
		CO3- Choose the criteria for selection of drugs and polymers for the development of Novel drug delivery systems.
		CO4- Classify polymers and modified drug delivery system.
		CO5- Evaluate various novel drug delivery systems.
		CO6- Design advance drug delivery including various dosage forms.

Mapping of Cos with Pos & PSOs

Course Outcomes	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	2	3	3	3	2	3	3	3	3	3	3	3	2	2
CO2	3	3	2	2	2	2	2	3	3	3	3	2	3	3	3	3
CO3	2	3	2	2	3	3	3	2	2	2	3	3	3	3	3	3
CO4	2	3	2	3	2	2	3	3	3	1	3	2	2	2	2	2
CO5	2	3	3	3	2	2	3	3	3	2	2	3	3	3	3	2
CO6	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

3: High, 2: Medium, 1: Low

M. Sc. Pharmaceutical Chemistry IInd Sem.

PROJECT

PAPER CODE –MPCR 201

20 Credits **MM: 600**

Project from parent institute/industry/Research Organizations. Project should be completed under the guidance of a faculty member in the same Department or Industry or research organization. In case of Industry / research organization one member of that body can also be included as project guide.

1. The project shall be submitted in the Department.
2. Pre submission presentation is compulsory; pre-presentation should be done in the presence of staff members of the department.

M. Sc. Pharmaceutical Chemistry IInd Sem.
DRUG REGULATORY AFFAIRS
PAPER CODE –MPCS 202 (a)

Lecture: 3 Hrs/week **Max. Marks: 100**

UNIT-I

Regulatory affairs: Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals

UNIT-II

Regulatory requirements for drug approval: Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.

UNIT-III

Quality management systems: Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by design, Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000.

UNIT-IV

Introduction to regulatory affairs and Indian regulatory requirements:

Introduction, International Drug Regulatory affairs, Drugs and Cosmetics Act and rules with special reference to schedule M.

Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Common Technical Document (CTD), Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

UNIT-V

A. **Good Laboratory Practices:** General provisions, organization and personnel, facilities, equipment, testing facilities operation, test and control articles, protocol for conduct of a nonclinical laboratory study, records and reports, disqualification of testing facilities
B. **Calibration and Validation:** Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan.

Recommended Books and Web link:

1. International Regulatory Affairs Updates, 2005. Available at http://www.iraup.com/about.php
2. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition.
3. Regulatory Affairs brought by learning plus, inc. available at http.//www.cgmp.com/ra.htm.
4. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and IsaderKaufer,Marcel Dekker series, Vol.143
5. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P.Martin, Drugs and the Pharmaceutical Sciences,Vol.185, Informa Health care Publishers.
6. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino,MD,5th edition, Drugs and the Pharmaceutical Sciences,Vol.190.
7. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons.Inc.
8. FDA regulatory affairs: a guide for prescription drugs, medical devices, and biologics/edited By Douglas J. Pisano, David Mantus.
9. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A.Rozovsky and Rodney K. Adams.

M. Sc. Pharmaceutical Chemistry IInd Sem.
HERBAL DRUG TECHNOLOGY
PAPER CODE – MPCS 202 (b)

Lecture: 3 Hrs/week **Max. Marks: 100**

UNIT-I

Herbs as raw materials

Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation, Sources of Herbs
Selection, identification and authentication of herbal materials, Processing of herbal raw material

Biodynamic Agriculture

Good agricultural practices in cultivation of medicinal plants including Organic farming.
Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

UNIT-II

Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

UNIT-III

Herbal Cosmetics

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

Herbal excipients:

Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrates, flavors & perfumes.

Herbal formulations:

Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

UNIT- IV

Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs
Stability testing of herbal drugs.

UNIT-V

General Introduction to Herbal Industry

Herbal drugs industry: Present scope and future prospects.
A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.

Schedule T – Good Manufacturing Practice of Indian systems of medicine

Components of GMP (Schedule – T) and its objectives

Recommended Books: (Latest Editions)

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari
5. Pharmacognosy & Phytochemistry by V.D.Rangari
6. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002

M. Sc. Pharmaceutical Chemistry IInd Sem.
ESSENTIAL OF TRADITIONAL MEDICINE
PAPER CODE – MPCS 202 (c)

Lecture: 3 Hrs/week **Max. Marks: 100**

UNIT-1

Definition, History and scope of Phytomedicines.

UNIT-II

Alternative system of medicine: Historical overview of Indian system of medicine-Ayurveda,Siddha, Homeopathic system of medicine, Development of Traditional system of medicine in India. Prospects of Traditional medicine.

UNIT-III

Herbal Remedies- Toxicity and Regulation: Importance of Herbal Therapies. Herbs versus conventional drugs. Efficacy of Herbal medicine. General concept of evaluation and quality control Assessment by drug Regulations. Herbal drug regulation in India.

UNIT-IV

Phytoconstituents and their Analysis: Introduction, Importance of Phytoconstituents in therapy, qualitative analysis of crude drug extract and isolates. Analysis of alkaloids, volatile oils, fixed oils , fats and waxes, Flavonoids, Terpenoides, Resins, Tannins, Glycosides and Steroids.

UNIT-V

Extraction of Herbal drugs: Introduction, Basic principles, Pre-extraction operations for crude drug, Effect of solvent, solvent mixtures and solution on extraction, Characteristics of Phytoconstituents, Procedure for extraction of Herbal drugs Extraction methods for specific phytochemical group, treatment of drug residue after extraction.

Recommended Books: (Latest Editions)

1. Essential of Pharmacognosy by Dr.S.H.Ansari
2. Pharmacognosy & Phytochemistry by V.D.Rangari
3. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
4. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

M. Sc. Pharmaceutical Chemistry IInd Sem.

ADVANCE DRUG DELIVERY PAPER
CODE – MPCS 202 (d)

Lecture: 3 Hrs/week **Max. Marks: 100**

Unit-I

Fundamental Concept of Modified Drug Release: Definitions of controlled release, sustained release drug delivery systems. Pre requisites of drug candidates, various approaches and classification: rate preprogrammed activation modulated, feedback regulated and site targetted

Formulation and evaluation of controlled release systems.– oral, dental and parenteral

Unit–II

Polymers- Definition, Classification and Characterisation, Biodegradable and non biodegradable polymers – properties and applications in formulation of various dosage forms.

Unit – III

Transdermal Drug Delivery systems- factors influencing transdermal delivery, mechanism of percutaneous penetration, formulation and evaluation lonophoresis and Iontophoresis.

Unit – IV

Target oriented drug delivery systems- prodrugs, Liposomes, Niosomes, Microparticles, Nano particles, anti bodies, cellular carriers, lipoproteins, Glycoprotein, Low molecular weight proteins.

Ocular, Nasal Drug Delivery system, stemceuticals, introduction to brain targeting.

Books Recommended:

1. Chien Y.W., Novel Drug Delivery Systems, Marcel Dekker.
2. Robinson J.R. and Lee V.H., Controlled Drug Delivery: Fundamentals & Applications, MarcelDekker.
3. Tse F.L.S. and Jaffe J.J., Biodegradable Polymers as Drug Delivery Systems, Marcel Dekker
4. Banker G.S., Rhodes C.T., Modern Pharmaceutics, Marcel Dekker.
5. Wise D.L., Handbook of Pharmaceutical Controlled Release Technology, Marcel Dekker.
6. Guy R.H., Hadgraft J., Transdermal Drug Delivery, Marcel Dekker.
7. Rathbone M.J., Hadgraft J., Modified Release Drug Delivery Technology, Marcel Dekker.
8. Swarbrick J. & Boylan J.C., Encyclopedia of Pharmaceutical Technology, Marcel Dekker.